

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Application of:

Charles R. Simmers

Application No.: 09/721,790

Filed: November 22, 2000

For Reissue of Pat. No. 5,841,431

For: APPLICATION OF SPLIT- AND  
DUAL-SCREEN LCD PANEL  
DESIGN IN CELLULAR PHONES

Examiner: David L. Lewis

Art Unit: 2629

Confirmation No.: 2547

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

**Declaration of Inventor Pursuant to 37 C.F.R. § 1.131**

I, Charles Simmers, hereby declare that:

1. At the time of conceiving and reducing to practice the above identified invention I was a citizen of the United States of America and was residing in the State of Arizona, in or around the greater Phoenix area. The above identified invention was conceived and reduced to practice in the United States of America.
2. I am the true inventor of the subject matter of the above-captioned application, as originally declared in the declaration dated November 14, 1996.
3. At the time of invention, I was employed by Intel Corporation (hereinafter "Intel"), the assignee of the above-captioned application.
4. To the best of my recollection and as refreshed by attached **Exhibit I**, the subject invention was conceived at least as early as January 2, 1996. **Exhibit I** is a

photocopy of an Invention Disclosure Form (IDF) dated January 2, 1996. The IDF discloses the invention described and claimed in the above-captioned application.

5. I additionally declare that I worked diligently with my colleagues in the legal department of Intel and designated outside counsel from at least prior to September 26, 1996 until constructively reducing the invention to practice, which took place no later than the filing of U.S. Application No. 08/749,486 (hereinafter "Application") on November 15, 1996, which issued as U.S. Patent No. 5,841,431 (hereinafter "Patent"), for which reissue is sought through the above-cited application.


The IDF was submitted to Intel's relevant technology patent committee (Patent Committee) on or after January 2, 1996. The Patent Committee then reviewed and selected for filing the IDF, and others, from among several hundred disclosures that the Patent Committee typically receives each quarter. Intel may process several thousands of such Invention Disclosure Forms submitted each year, and in committees that meet quarterly, they select for filing from among those submitted about 1000 – 2500 each year. The selection and prioritization includes selection of appropriate patent counsel to prepare the applications. The law firm of Blakely, Sokoloff, Taylor, and Zafman (BSTZ) was selected for the drafting of the Application covering the invention disclosed in the IDF. During the period from at least prior to September 26, 1996 to November 15, 1996 I assisted representatives of BSTZ in the preparation and filing of the Application.

To the best of my recollection, my assistance in the preparation and filing of the Application involved discussing various aspects of the invention with a drafting attorney. Following this discussion, I reviewed one or more drafts of the Application, which culminated in a review of the final draft of the Application on or about November 13, 1996. **Exhibit II** is a copy of a letter dated November 13, 1996 transmitting the final draft of the Application along with the assignment, power of attorney, and declaration. My final review and execution of the accompanying paperwork led to the filing of the Application on November 15, 1996.

**I further declare that all statements made herein of my own individual knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the**

**knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified patent application or any patent issued thereon.**

Executed by and on the date(s) as set forth below:

By:   
Charles R. Simmers

Date: 4/30/07

LEGAL# \_\_\_\_\_ P# \_\_\_\_\_  
BSTZ# \_\_\_\_\_ SHSL# \_\_\_\_\_

DATE:

01-04-96 ✓

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It is important to provide accurate and detailed information on this form (fill in ALL areas under Inventor[s]). The information will be used to evaluate your invention for possible filing as a patent application. When completed, please return this form to the Legal Department at HF3-03. If you have any questions regarding this form or to whom it should be forwarded, please call 696-5455. PLEASE, PRINT CLEARLY OR TYPE.

## 1. Inventor(s):

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(PROVIDE SAME INFORMATION AS ABOVE FOR EACH ADDITIONAL INVENTOR)

## 2. Title of Invention:

APPLICATION OF SPLIT- AND DUAL-SCREEN LED  
PANEL DESIGN IN CELLULAR PHONES

## 3. Stage of development, i.e. % complete, and relation of technology to the following product/process:

## 4. (a) Has a description of your invention been, or will it shortly be, published outside Intel:

NO: ☒ YES: \_\_\_\_\_ DATE WAS OR WILL BE PUBLISHED: \_\_\_\_\_  
(fill in best estimate)If YES, was the manuscript submitted for pre-publication approval?  
YES: \_\_\_\_\_ NO: \_\_\_\_\_

(b) Has your invention been used/sold or planned to be used/sold by Intel or others?

NO: ☒ YES: \_\_\_\_\_ DATE WAS OR WILL BE SOLD: \_\_\_\_\_  
(fill in best estimate)5. If invention conceived, or constructed during performance of a government or third party contract, please check here and give the contract name and number NA

## 6. Please attach a page to this form, DATED AND SIGNED BY ONE INVENTOR (PREPARER), to provide an abstract of your invention, and include the following information in your abstract:

- (a) State general purpose(s) of your invention;
- (b) Describe advantage(s) of your invention over what is done now;
- (c) Describe essential element(s) or key to your invention; and
- (d) Value of your invention to Intel (how will it be used?).

\*HAVE YOUR SUPERVISOR READ, DATE AND SIGN COMPLETED FORM

DATE:

1/2/95

SUPERVISOR:



BY THIS SIGNING, I (SUPERVISOR) ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND THIS DISCLOSURE, AND RECOMMEND THAT THE HONORARIUM BE PAID.

EXHIBIT 1

Page 1

## Application of Split- and Dual-Screen LCD Panel Design in Cellular SmartPhones

### Split Screen Display

In many high-end, smart- cellular phone applications it is necessary to provide two types of displays to the user. The first is used most often for the telecommunications functions. It consists of ten to twenty characters across by three to eight lines. It may also display some operational graphic icons to signify connection progress, battery life, signal strength, etc. The second, larger display is associated with the Personal Data Assistant (PDA) function and is a graphical display with resolutions up to 640x480 pixels. Since this display is used only a fraction of the time compared to the communications display, it is usually powered-down when not in use.

The current design practice is to treat these two units as separate systems. Each module would have its own controller to format memory data into displayable form, duplicate driver ICs, and separate LCD panels. In a battery-power-conscience systems such as cellular phones, this redundancy increases power requirements, board real estate, manufacturing costs, and reduces MTBF.

In order to reduce the redundancy between the two systems, this disclosure proposes to integrate the two functions using a common controller, LCD panel and drivers, while disabling driver circuits when the PDA is not needed. For purposes of illustration, we will discuss an application utilising a 640x240 (½ VGA) resolution monochrome passive-matrix LCD. The telecommunication portion of the display will use a 160x240 subsection of this panel and power-down the other three-quarters of the unit. These sizes and fractional parts are based, predominantly on the organisation of drivers used in a given design, and could be adjusted to fit most other panels. A 160x240 section, in landscape aspect, would yield an area capable of displaying 20 lines of 30 5x7-matrix characters.

Figure 1 shows a typical LCD module with its driving circuits. Not shown is the analog section that generates the various voltage levels and controls contrast as this remains unchanged is is not relevant to the discussion.

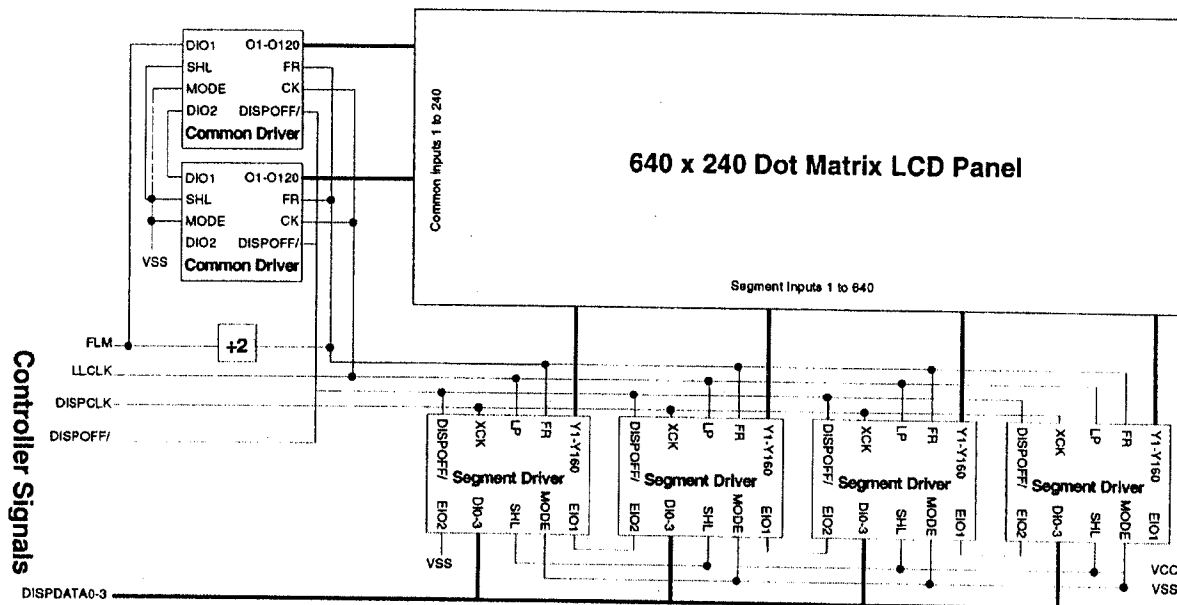


Figure1.

The row to be written is selected by the common drivers. The row is marked by a pulse on the First Line Marker (FLM) signal and clocked by Line Latch Clock (LLCLK). The rows are sequentially selected by subsequent LLCLK clocks. The pixel data is presented by the Display Data lines (DISPDAT0-3) and clocked/shifted by Display Clock (DISPCLK). The two signals to note are the FLM connected to the DIO1 pin of the first common drivers, and the

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VSS connected to the EIO2 pin of the first segment driver. These signals mark the upper and leftmost pixel of the display.

If the power supply lines (VCC and VLCD) were turned off to the second through fourth segment drivers, three-quarters of the display would be disabled and considerable power saved. This is shown in Figure 2.

Here only the common drivers and one segment driver are left on to operate one quarter of the panel.

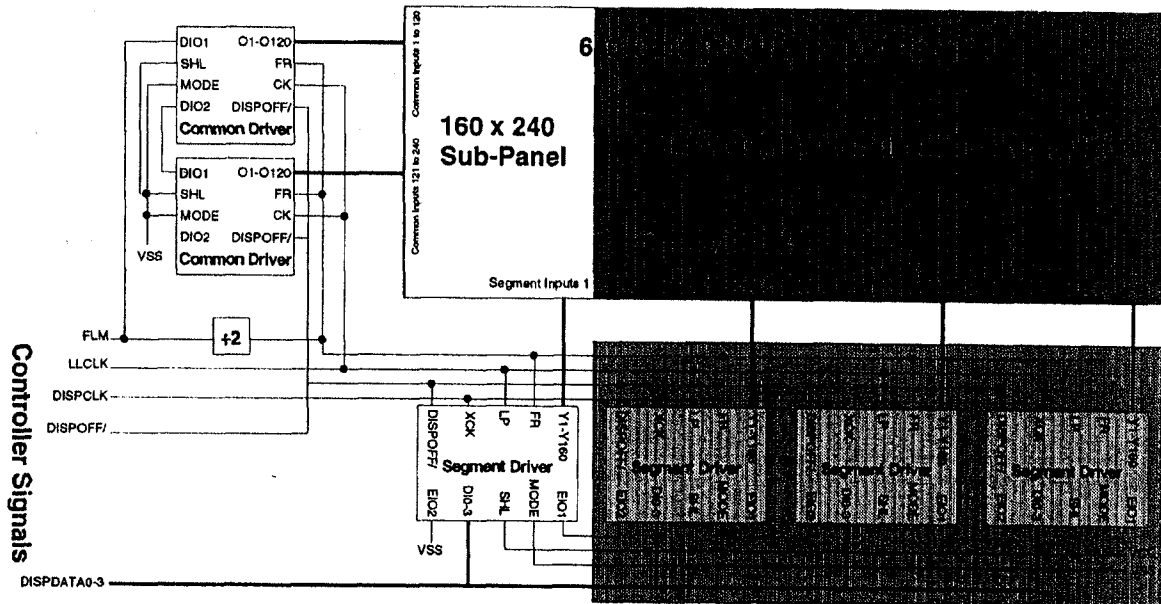


Figure 2.

The implementation of this change to the display module would very easy as only a minor engineering change is needed to disable the power going to the last set of segment drivers, under software control. A clam shell case could be constructed that obscures the righthand side of the display and only exposes the the working section. such as shown in Figure 3.

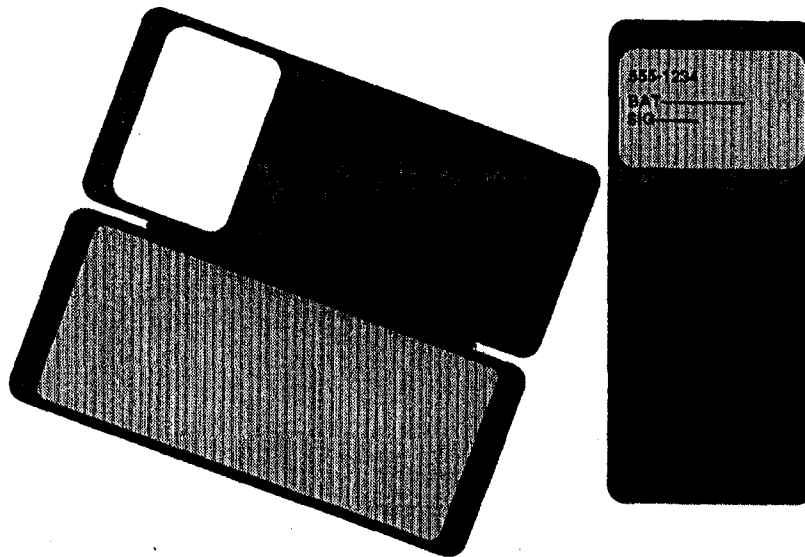


Figure 3.

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The lid would incorporate a switch to inform the operating system whether the lid was opened or closed. The internal registers of the display controller would need to be reinitialised to the large or short configuration depending on the status of the lid. The software display driver in the operating system would also need to be informed of the change in resolution and viewing angle.

## Dual Screen Display

If the design of the phone dictates that the two display subsystems must be physically located on different planes, some power savings can still be realised by using a single controller for both the phone display and the PDA. Either display, or both, could be operational at any time. Logically, the smaller display looks like an extension to the larger display. The only provision is that the smaller panel have the same number of horizontal lines, therefore the same duty cycle, as the larger. The software would view both displays as one large 800x240 frame buffer. Refer to Figure 4.

A feature of these architecture is now the phone display is a graphics type rather than character oriented as most phones. Having graphics capabilities enables use of icons, multiple fonts, and other images that convey more meaningful information.

Additionally, if the mechanical layout permits viewing both panels at the same time, the incremental information available on the smaller screen will enrich the information content of the main screen (e.g. context-sensitive help or information screen).

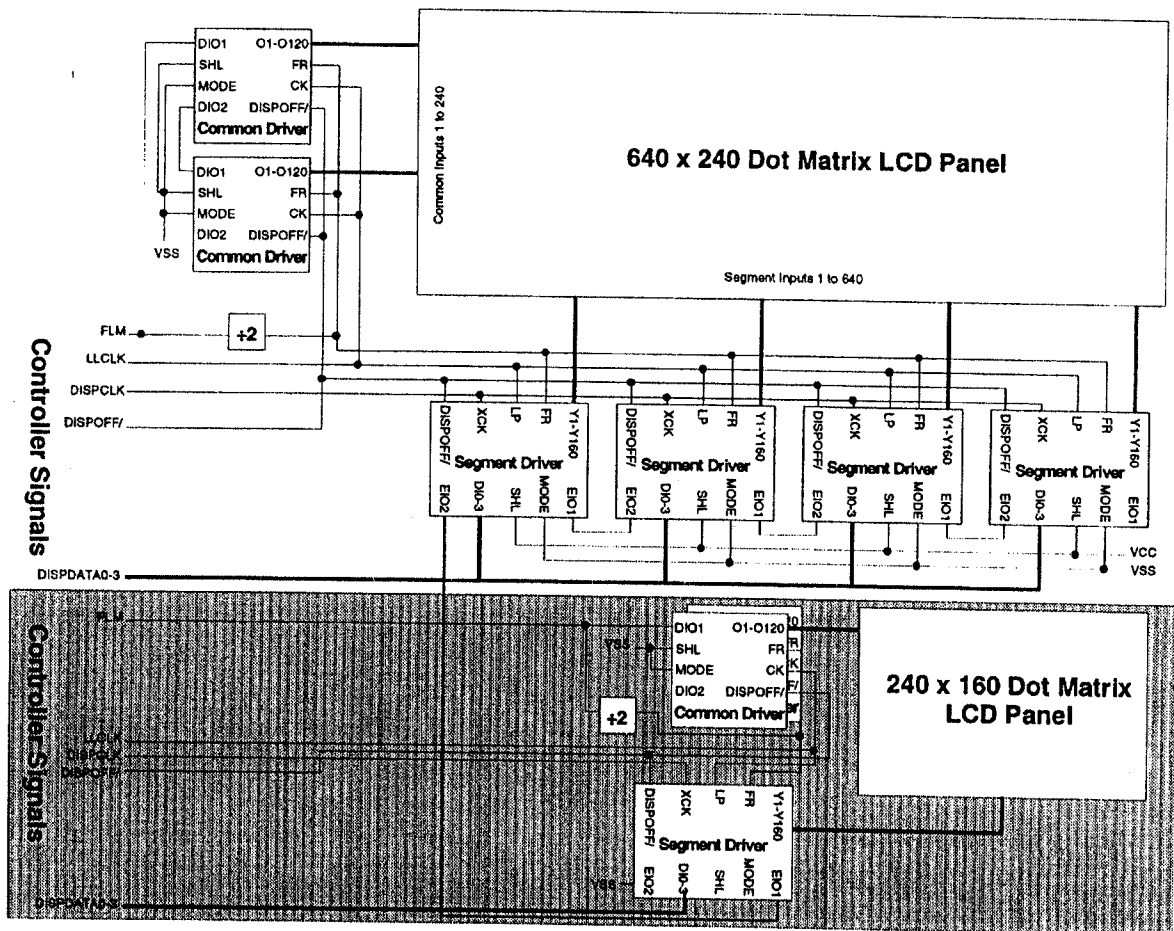


Figure 4.

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Since the phone panel logically precedes the PDA panel in the serial stream, the large display could be shutdown most of the time and only activated when necessary. Although this design does not realise the reduction in complexity of the former, having eliminated the second display controller, it does provide for a greater latitude in flexibility. The only modifications made to the standard display would be the additon of a pin to bring out EIO2 from the PDA display and a pin on the phone display to add the EIO1 function, both very minimal changes.

### **Summary**

None of the aforementioned designs require any changes to existing display controllers. All changes are done in software. Only a very minimum of engineering changes need to be done on standard LCD modules to enable this architecture. The power savings to be had by reducing redundancy and powering-down unused display sections can be considerable.

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OF COUNSEL:  
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RONALD W. REAGIN

November 13, 1996

**ATTORNEY-CLIENT PRIVILEGED**  
**CONFIDENTIAL COMMUNICATION**

**Via Federal Express**

Mr. Chuck Simmers  
INTEL CORPORATION  
M/S: C6-306  
5500 Chandler Blvd.  
Chandler, Arizona 85226-3699

RE: U.S. Patent Application for:  
**APPLICATION OF SPLIT- AND DUAL-SCREEN  
LCD PANEL DESIGN IN CELLULAR PHONES**  
Our File No.: 042390.P3581

Dear Chuck:

Enclosed please find a final draft of the above-noted patent application. Please carefully review the revised application and associated drawings. If any further changes are deemed necessary, please call me at your earliest convenience.

Once you have completed the review, if all is in order, please sign and date the Declaration and Power of Attorney attached as the last two pages of the application and the enclosed Assignment of the patent application to Intel Corporation. After you have signed these documents, please forward them to me in the enclosed Federal Express envelope for filing with the U.S. Patent and Trademark Office.

Please bear in mind that the description of the invention should be in sufficient detail such that a person skilled in the field of the invention can make and use the invention without undue experimentation. Another requirement necessary to obtain a valid patent is that the best mode known to the inventor for practicing the invention must be included in the description of the invention.

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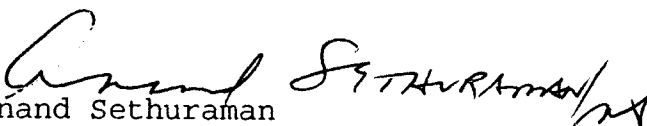
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Mr. Chuck Simmers  
November 13, 1996  
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Also, please keep in mind that you have a continuing duty to disclose to the Patent and Trademark Office information you are aware of that is material to patentability. For example, if you are aware of any articles bearing on your invention, please bring them to our attention. It is our understanding that the invention has not been patented or described in a printed publication in this or a foreign country, or in public use or on sale in this country more than one year prior to the date that we intend to file this application. Please let us know as soon as possible if you believe otherwise. If you have any questions concerning the above-noted points, please do not hesitate to call.

Very truly yours,

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